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Human Platelet Lysate as a Xeno Free Alternative of Fetal Bovine Serum for the In Vitro Expansion of Human Mesenchymal Stromal Cells

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ABSTRACT

Background: Mesenchymal stromal cells (MSCs) are employed in various different clinical settings in order to modulate immune response. Human autologous and allogeneic supplements including platelet derivatives such as platelet lysate (PL), platelet-released factors (PRF) and serum are assessed in clinical studies to replace fetal bovine serum (FBS). The immunosuppressive activity and multi-potential characteristic of MSCs appear to be maintained when the cells are expanded in platelet derivatives.

Materials and Methods: Platelet-rich plasma was collected from umbrical cord blood (UCB). Platelet-derived growth factors obtained by freeze and thaw methods. CD62P expression was determined by flow cytometry. The concentration of PDGF-BB and PDGF-AB was detemined by ELISA. We tested the ability of a different concentration of PL-supplemented medium to support the ex vivo expansion of Wharton's jelly derived MSCs. We also investigated the biological/functional properties of expanded MSCs in presence of different concentration of PL. The conventional karyotyping was performed in order to study the chromosomal stability. The gene expression of Collagen I and II aggrecan and SOX-9 in the presence of different concentrations of PL was evaluated by Real-time PCR.

Results: We observed 5% and 10% PL, causing greater effects on proliferation of MSCs .These cells exhibited typical morphology, immunophenotype and differentiation capacity. The genetic stability of these derivative cells from Wharton's jelly was demonstrated by a normal karyotype. Furthermore, the results of Real-time PCR analysis showed that the expression of chondrocyte specific genes was higher in MSCs in the presence of 5% and 10% PL, compared with FBS supplement.

Conclusions: We demonstrated that PL could be used as an alternative safe source of growth factors for expansion of MSCs and also maintained similar growing potential and phenotype without any effect on chromosomal stability.

Keywords: Mesenchymal stromal cells, Umbilical cord blood, Platelet lysate, Immunomodulatory properties, Cell therapy

INTRODUCTION

Mesenchymal stem cells (MSCs) are multipotent cells that can differentiate into several types of cells. The first published report by Friedenstein et al. describing the expansion of an adherent, spindle-shaped population of cells from whole human bone marrow.[1,2] MSCs or MSC-like cells have also been expanded from other tissues including adipose tissue, umbilical cord blood (UCB), dental pulp, amniotic fluid, and numerous other sources.[2,3] Human MSCs (hMSCs) also have